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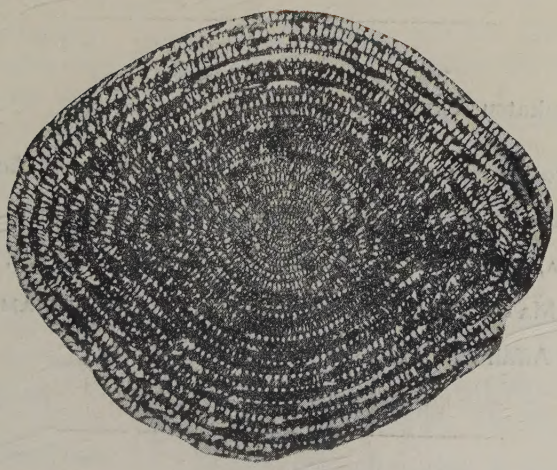

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TRANSACTIONS

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Geological Institute, Faculty of Science, University of Tokyo, Japan

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258. ON THE OCCURRENCES OF *ATURIA* IN PROVINCES OF ETCHU AND IWAMI AND THEIR BEARING ON THE PALAEOFLUMENOLOGY IN THE MIOCENE OF JAPAN.*

TEIICHI KOBAYASHI and KIYOSHI MASATANI

越中，岩見に於ける *Aturia* の産出とその日本中新世古海流学上に於ける意義：一嘗つて正谷が富山県上新川郡大沢野町葛原土川で発見した *Aturia* は小林によると *A. minoensis* でその産地を見ると之は相当の深さの寒海堆積物の間へ海底地辷りで狭まれたらしい浅い暖海性礫岩レンズから採集されたもので同産地に 2 個の *Nautilus* の破片も出た点から見て，之等の死浮游性の殻は原対島海流によつて台湾・琉球方面から漂流して来たものと考へられる。島根県浜田の唐鐘層中に発見された *Aturia* sp. indet. もこの考察を支持する一新事実である。　　小林貞一・正谷　清

It was over 10 years ago that the junior author had discovered a specimen of *Aturia* from the Miocene Yatsuo series[1] at Tsuzara, near Sasazu in Etchu, Toyama Prefecture,[2] as reported already by him (1946). It belongs now to the collection of the Geological Institute, Hiroshima University. Lately this specimen in addition to another nautiloid from Iwami, Shimane Prefecture, were sent by IMAMURA to the senior author for study. The former is identified here with *Aturia minoensis*, recently described by the senior author (1954). He visited then the locality with TSUDA as a guide and confirmed its being a necroplanctonic float.

Before describing these specimens and discussing their palaeoflumenological bearing on the *Proto-Tsushima oceanic current*, the authors wish to thank Prof. Sotoji IMAMURA of the Hiroshima University and Mr. Karyu TSUDA, lecturer of the Niigata University.

Aturia minoensis KOBAYASHI

Plate 1, Figures a-d.

1954. *Aturia minoensis* KOBAYASHI, *Japan. Jour. Geol. Geogr.* vol. 25, p. 35, pl. 5, figs. a-d; text-fig. 1.

Description:—The Tsuzara specimen is smaller than the holotype from Hazamagahara of Togari, its maximum radius being 41 mm. where the whorl is 18.5mm. in breadth. In the same section the

* Read Oct. 9, 1954; received Sept. 3, 1954.

1) The sequence of the Yatsuo Series

Otogawa (音川) Series

Yatsuo (八尾) Series
- Joyama (城山) beds
- Kurosedani (黒瀬谷) beds
  - Kashio (樫尾) alternations of mudstone, sandstone and conglomerate
  - Kakehata (掛畑) conglomerate, sandstone and mudstone
  - Kamikurose (上黒瀬) alternation of sandstone and mudstone
- Iwaine (岩稲) beds
- Nirehara (楡原) beds

Jurassic Tetori Series and Hida gneiss complex

2) 富山県上新川郡大沢野町葛原土川

radius of the penultimate whorl is 15mm. The siphuncle of the ultimate whorl is located at a distance of about three-fourths the length from its venter to that of the penultimate whorl.

Both of these specimens are middle Miocene in age and agree with each other in all of the observable characters, namely in the mode of coiling, whorl section, septal distance and so forth. The ventral saddle is subquadrate but with a shoulder on each side and the lateral side a little sigmoidal. Starting from the preceding shoulder, the septal suture describes a large semi-circle on the flank which is more strongly convex on the inner than on the outer side.

The conch is compressed laterally with the result that the septa in the inner volutions are seen to be broken into pieces. A part of the outer shell remains on a flank of the last whorl, but no surface marking is preserved.

For the comparison of this species with its allies the reader is referred to the senior author's paper (1954).

Occurrence:—Dogawa, Tsuzara, Osawano-town, Kami-shinkawa-gun, Toyama Prefecture; middle Miocene Kurosedani beds of the Yatsuo series.

The upper division of the Kurosedani beds which is called Kashio, is marked off from the upper Miocene Joyama beds by a thin layer of sandy tuff. At the cliff of Dogawa a few other layers of sandy tuff are intercalated in the mudstone beds. In addition there are two wedges of conglomerate in the sequence, which contain pre-Tertiary rocks, andesites and reworked angular mudstones. The upper wedge whence the *Aturia* specimen was procured is about 1.2 m. at the thickest and contains many shells most of which are however broken. *Patinopecten kimurai, Chlamys nisataiensis, Venericardia, Glycymeris, Siphonalia* and *Turritella yoshidai* are common members. It is noteworthy that TSUDA obtained two fragmentary shells of *Nautilus* at this small wedge. While the wedges of conglomerate are warm shallow sea sediments, the mudstone must be a much deeper and cooler bottom sediment not only because of its fineness, homogenity and uniformity but also because thin shelled *Yoldia* and *Propaeamusseum* are found scattered in it.

Because intraformational folds are occasionally found in the mudstone beds at other places, it is probable that the conglomerate wedges are shifted blocks slipped down on the off-set plane of a fossil delta.

The Kashio division is thus composed of mudstone, sandstone, conglomerate and sandy tuff and yields *Operculina* and *Miogypsina* beside them. The oceanographic situation at that time is presumed to be similar to that of the Toyama bay at present in the respect that the surface water was warm but the deep one cool.

The middle division of the Kurosedani beds called Kakehata consists of similar alternations. According to OYAMA (1950), the *Telescopium-Geloina* biocoenosis in it comprises about 40 species in *Littorionopsis* (*scabra* group), *Telescopium, Rhizophorimurex, Geloina* and so forth. Noting that *Batillaria, Corithidea, Stenothyra* and *Glaucome* live in hypohaline waters, the former two are found only in tidal zone, *Natica, Tritia, Decolifer, Estelacar, Scapharca, Joannisiella, Cyclina* (s. str.) and *Clementia* (s. str.) found in hypohaline waters and from the tidal zone down to deeper waters, and *Tatwiwaia, Vicaryella* and *Vicarya* may be considered tidal zone dwellers, etc., he emphasized the mangrove swamp for the habitat of these Molluscans.

Bunolophodon is known to occur in the Kamikurose alternation of sandstone and mudstone in the lower part of the Kurosedani beds and *Liquidamber formosa* HANCE and *Comptoniphyllum naumanni* NATHORST in this and middle divisions. These plants indicate warm land climate.

Returning to the cephalopods, the coexistence of two *Nautili* and one *Aturia*, all fragmentary, in a small wedge of conglomerate is a remarkable fact because *Aturia* and *Nautilus* are both rare genera in the Miocene of Japan. As mentioned above, it is recognizable that a warm current was flowing along the coast of this region in the middle Miocene epoch. It is known further that living *Nautilus* happens to come ashore. Its usual habitat is, however, at the bottom in a deep water. Furthermore, if considered that gregarious occurrence of the rare fossils (KOBAYASHI, 1954), these Nautiloids must be necroplanctonic floats.

Prof. Shozo MONJI of the Botanical Institute, University of Tokyo kindly informed the senior author of the fact that the northern limit of mangrove swamps may be Okinawa of the Ryukyu islands where is a natural forest of *Bruguiera gymnorrhiza* LAM. at Yagagi-shima, Hane-village, Kunigami-gun,[3] although its occurrence is reported from Atumi-Oshima. A few bushes of *Kandelia Rheedii* WRIGHT et ARN. at Kinyu village, Ibusuki-gun[4] and Kaseda village, Kawabe-gun,[5] both in Prov. Satsuma, Kagoshima Prefecture, Southern Kyushu, are said in traditions to have been imported from the Ryukyus in 1614 (NAKANO, 1920). Assuming the northerly shifting of isotherm for some 10 degrees of latitude in the middle Miocene epoch which is suggested by the *Telescopium-Geloina* biocoenosis, *Nautilus* would have been able to thrive near Formosa as does in the central Philippines.

Miocene was the time of a great submergence for Japan. As discussed elsewhere (KOBAYASHI, 1941), there was already the *Proto-Japan sea.* The distribution of *Vicarya, Miogypsina-Operculina* and other fossils warrants that there was the *Proto-Tsushima current* on the continental side of the insular arc. Therefore it is highly probable that *Aturia minoensis* in question as well as indeterminable *Nautili* associated with it in the same conglomerate wedge have flown by the current from the south or possibly from off Formosa or Yaeyama islands of the Ryukyus and found a place to settle in this region.

Aturia sp. indet.

Plate 1, Figures e-f

This specimen was obtained from the Miocene Togane formation at Senjojiki of Togane, near Hamada, Province Iwami, Shimane Prefecture. From the other Molluscans OTUKA (1937) concluded that the Togane formation is contemporaneous with the Lower Kadonosawa Series in Province Mutsu, North Japan, but noted that the fauna of the former is different from that of the latter in the lack of any cold water element. The Lower Kadonosawa series is the Kadonosawa proper the age of which is middle Miocene (HANZAWA, 1954).

The chambered shell with a siphuncle belongs undoubtedly to a nautiloid. As seen in the magnified figure, septa are prolonged into long funnels from their

3) 琉球国頭郡羽地村屋我地島
4) 鹿児島県揖宿郡喜入村
5) 鹿児島県川辺郡加世田村大浦川河口
6) 島根県那賀郡国府村唐鐘千畳敷

necks. They are each invaginated into the preceding funnel almost as long as the septal distance. There is a narrow space between any two funnels, but whether or not there was a connecting ring in this place (MILLER and FURNISH, 1938) cannot be answered with this weathered specimen.

As it has a holochoanoidal siphuncle, it belongs evidently to *Aturia* which is the only Miocene survivor among the *Hercoglossa-Aturia* group (MILLER, 1949) and a sole genus of the kind so far known from the Tertiary of Japan. Its septal distance is as short as that of *Aturia minoensis* with which it is nearly coeval. In this state of preservation, however, it is extremely difficult to make an exact specific identification.

Though fragmentary, it is worth while to describe not only because of its new find in this area, but also because it vindicates the above suggested course of the *Proto-Tsushima current*.

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Explanation of Plate 1

Figures 1-4. *Aturia minoensis* KOBAYASHI from the middle Miocene Kurosedani beds of the Yatsuo series at Dogawa, Tsuzara, Osawano-town, Kami-shinkawa-gun, Toyama Prefecture, (Province Etchu). One and a half times magnified.

Figure 5. *Aturia* sp. indet. from the Miocene Togane formation at Senjojiki of Togane near Hamada, Shimane Prefecture (Province Iwami). Twice magnified.

These two specimens are kept in the Geological Institute, Hiroshima University.

1

2

3

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5

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 17, pp. 5-12, Pl. 2, 1 text-fig., Apr. 10, 1955.

259. *EUMORPHOTIS MULTIFORMIS SHIONOSAWENSIS*, SUBSP. NOV. FROM THE SHIONOSAWA LIMESTONE AT SHIONOSAWA, NORTH OF THE SANCHU GRABEN, KWANTO MOUNTAINLAND, JAPAN.*

KOICHIRO ICHIKAWA and YUKIO YABE

Division of Geoscience, Institute of Polytechnics, Osaka City University and
Geological and Mineralogical Institute, Faculty of Science, Tokyo University of Education.

関東山地山中地溝帯北方の塩沢石灰岩産 *Eumorphotis multiformis shionosawensis*, nov. について：筆者の一人矢部によれば，表記の地域には紡錘蟲石灰岩を含む下部ペルム系（大平層）が分布しているが，一見，同層中にある塩沢石灰岩より，最近鹿間時夫はトリアス紀古世の *E. multiformis* var. 等の産出を報じている。同石灰岩と大平層との地質関係は不明確であるが，とにかく，その主要産出化石は，正しく *E. multiformis* であり，その新亜種に属する。保存良好な多数の標本を検討した結果，*Eumorphotis* 類の性質を明かにする上に大切な新知見を得たので，ここに，その詳細な記載を報ずる。　　市川浩一郎・矢部之男

In 1947, IWAI reported the occurrence of *Aviculopecten* sp. and *Naticopsis* sp. from a limestone lens within the Permo-Carboniferous Chichibu complex distributed to the north of the Sanchu graben.

The limestone is located at the entrance of the Kamakakezawa (of Shionosawa, Ueno-mura, Tano-gun, Gumma Pref.) about 500m north of the northern fault of the Sanchu graben. Subsequently, SHIKAMA (1952) expressed the opinion that the limestone is early Triassic in age, yielding *Eumorphotis multiformis* BITTNER var., *Anodontophora canalensis* CAT., *Oxytoma* sp., *Naticopsis*? sp. and an indeterminable gastropod. He then proposed provisionally the name Shionosawa for the formation including the mentioned limestone. The formation, however, seems not to be distinctly defined against the surrounding Chichibu complex. (See postscript II)

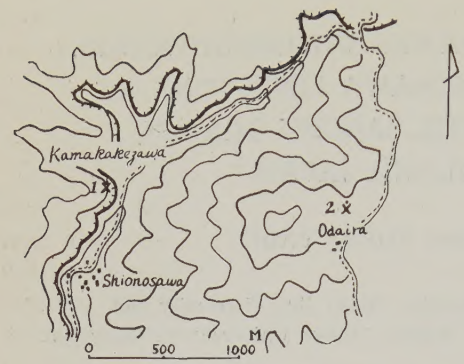
During his general survey of the central part of the Sanchu graben, the junior author made a rich collection of fossils from the above-mentioned locality. According to him, the area around the locality is mainly occupied by the Lower Permian Odaira formation which is mostly composed of green or purple tuffs, tuffaceous rocks and cherts with a subordinate amount of clastic rocks.

At a point (Loc. 2 in the index map) about 1700m east of Shionosawa he discovered a limestone lense within this formation, yielding *Parafusulina fountani* DUNBAR et SKINNER, *Schwagerina japonica* GÜMBEL, *Acervoschwagerina* sp., *Codonofusiella*? sp., and some minor foraminifera.[1)]

There are two kinds of limestone at Shionosawa, i.e., the main impure limestone member and the fossiliferous

* Read Oct. 9, 1954, received Oct. 5, 1954

1) For the identification of fusulinids, the authors are indebted to Mr. MORIKAWA of the Saitama University.



Locality Map
Loc. 1 Shionosawa limestone
Loc. 2 Odaira limestone

limestone member, the latter of which is no more than 2m thick. The name, Shionosawa limestone, is here used for the latter member. The Shionosawa limestone thus defined is interpreted to be an exotic block shut in the Lower Permian Odaira formation by a kind of fault, although there remain some doubts as to its field occurrence.

Because the Triassic formation has not been known to the north of the Sanchu graben in the Kwanto mountainland, the age determination of the dubious block ought to be very prudent. With the insufficient materials it is sometimes difficult to distinguish the late Palaeozoic aviculopectinids from the Triassic eumorphotids.

As the result of their careful works on the extensive collection, however, the present authors could ascertain that the main member of the Shionosawa fossil-coenesis is a new subspecies of *Eumorphotis multiformis* (BITTNER).

The present paper deals only with the description of this new subspecies of *Eumorphotis multiformis*. Detailed comments on the geology of the environs and the description of the remaining species will be given by the junior author in another opportunity.

Thanks are due to Dr. K. NAKAZAWA of the University of Kyoto for the opportunity of examining *Eumorphotis* from Kyoto Prefecture, which he has recently described. As a graduate student of the Tokyo University of Education the junior author here records his indebtness to Prof. H. FUJIMOTO and Prof. K. HATAI of the same University. Further, he wishes to thank Mr. J. ARAI of the Chichibu National Museum for the support given to him during his survey.

Description of Species

Genus *Eumorphotis* BITTNER, 1901

Jahrb. Geol. Reichsanst. 50, p. 566

Genotype: *Pseudomonotis telleri* BITTNER, 1898 (designated by DIENER, 1923, p. 40)

Remark:—Generic character of *Eumorphotis* and its distinction from the other allied genera will be given in the forthcoming paper by the senior author.

Eumorphtis multiformis (BITTNER) *shionosawensis* ICHIKAWA et YABE, subsp. nov.

Plate 2, Figures 1-15

Materials: There are more than a hundred fine specimens of the left valve and several tens of the right valve at hand.

Description: Shell thin, medium sized for the genus, the left valve being commonly 30 to 35 mm high (rarely 44 mm high), a little higher than long, length by height being 1.04-1.18, a little inequilateral, only slightly prosocline in the adult, and becoming a little elongated postero-ventrally. The left valve convex

and the right only slightly convex.

Left valve longitudinally ovate in outline, regularly and well inflated, the maximum convexity lying at about dorsal two-fifths of the height and the maximum length at about the mid-height. Dorsal margin almost straight, about six-sevenths as long as the shell length, the anterior side being about three-fourths of the posterior; anterior and posterior margins broadly arcuate, turning gradually into the well rounded ventral margin. Both wings not distinctly differentiated from the shell body, the anterior one smaller than the posterior and a little convex, its anterior margin forming the angle of about 60° with the dorsal margin in the adult specimen, curving inward as it descends, and finally ending in the weak concavity at the junction with the anterior margin of the shell body, the boundary line between the wing and the shell body is weakly sulcated in the interior, but not so on the external appearance, hence the part is thickened; posterior wing projected posteriorly, but never exceeding beyond the posterior extremity, its postero-ventral margin forming a concave arc and gradually grading into the posterior margin of the shell body. Umbo located at the anterior two-fifths of the shell length, only slightly prosogyrated, narrow, but well convex, rising a little above the hinge-line, curving inward and ending in the pointed summit at the dorsal margin. Surface of the shell body and the anterior wing covered with the radial ribs of the 1st, 2nd, (and rarely 3rd) orders and the finer radial striae. The ribs increasing in number by insertion and comparatively fine, but the differentiation into orders is distinct at least on the mesial part, those of the 1st and the 2nd orders alternating each other and rarely intercalating that of the 3rd order. The first kind of ribs appearing already in the early stage, 0.5 mm high, the second from the umbonal part, about 3.5 to 5mm in height and the third from the still later stage. The interspaces between the neighbouring each two of ribs wide and covered with very fine and close-set radial striae, which count 6–9 in the mesial part and are not entirely uniform in strength and some of which become nearly as strong as the ribs of the 2nd or the 3rd order in the later stage of growth. The concentric element of the sculpture is lacking except for the very fine and close-set growth striae which in later stage of growth form lattices with the fine radial just mentioned. The posterior wing is marked only with the comparatively distinct fine radial striae and the growth striae. Ligament area is very narrow and provided with very fine close-set horizontal striae, the dorsal and ventral margin of the area nearly parallel-sided in the main part, the ligament groove behind the umbo is quite shallow and oblique like that of the modern *Pinctada martensii* DUNKER, but not as wide as the latter. Right valve slightly convex throughout the shell body, the maximum inflation lying at about the mid-height or slightly higher. Dorsal margin straight, its anterior side being about three-fourths of the posterior side. The outline similar to that of the counter valve except for the antero-dorsal margin and the wing part. Antero-dorsal margin oblique and nearly straight, but only slightly concave near the beak. Posterior wing small, less protruded and more shallowly sinuated below than that of the counter valve, its posterior margin forming the angle of about 70°–80° (rarely 45°) with the dorsal margin. Anterior byssal ear semicircular in out-

line, separated from the shell body by a very narrow and deeply incised serration. Surface of the shell body and the posterior wing covered with fine numerous, close-set radial striae of two or rarely three orders. The stronger striae are a little more crowded and more numerous than the radial ribs on the counter valve, the weaker striae inserted between each two of them are less in number than those on the other valve. Concentric fine growth striae are especially distinct on the posterior wing.

Observation: The shell is quite thin except for the boundary part of the anterior wing and the shell body in the left valve, where it is comparatively thick. Accordingly, the muscular impressions are hardly discernible in spite of the favorable state of preservation.

Measurement in mm.

Left valve

Specimen No.	Reg. no	Height	Length	Height/Length	Thickness
(1)	5401 Holotype	44.0	38.5	1.14	11.5
(2)		31.5	29.0	1.08	9.0
(3)		33.5	31.0	1.08	10.0
*(4)	5411	39.0	34.5		11.0
(5)		44.0	39.5	1.11	11.5
(6)		34.5	29.0	1.18	8.0
(7)		29.0	25.0	1.16	8.5
(9)	ocu 251	31.0	26.5	1.17	8.0
(10)		20.0	18.3	1.11	7.9
(11)		33.0	30.0	1.10	6.5
(13)	5413	34.0	32.7	1.04	11.0
*(14)		29.5	25.0		7.5
(15)		23.0	19.5	1.18	7.0
(16)	5408	24.0(+)	21.5		7.0
(51)	5410	34.7(+)	33.5		11.0
(52)		37.0	21.0(+)		11.5
(53)		25.0	22.1	1.13	10.0
(54)		34.5	29.7	1.16	11.3
(56)		24.4	22.8	1.05	9.0
(57)		24.0	22.3	1.08	9.5
*(58)		26.5	26.5		8.5
(59)	5412	34.5(+)	34.0(+)		9.0
(60)	5407	22.2(+)	23.0(+)		10.5
(61)		30.0(+)	24.5(+)		8.0
(62)		30.5	26.0	1.18	8.0
(63)		34.0(+)	25.0(+)		10.0
(64)		27.5	24.0	1.14	7.0
(65)		38.7(+)	35.7		10.7
(90)	5409	27.0(+)	27.5		8.0

Right valve

(31)	5402 Paratype	26.5	23.5	1.13	4.5
(32)	5405	25.0(+)	25.0		3.0
(33)		27.0	24.5	1.10	2.5
(34)		25.0	24.0	1.04	2.0
*(35)		23.0	23.0		2.0
(36)	5406	24.5(+)	28.0		2.5
*(37)		24.5	24.5		2.0
(40)	ocu 252	19.5	17.0	1.13	2.0
(41)		26.0	23.0	1.13	4.0
(38)	5403	28.0(+)	26.5		2.5
(71)		27.0	24.6	1.10	2.5
(74)		31.5	29.3	1.08	4.5
(76)		22.4	21.4	1.05	2.5
(78)		23.5	22.1	1.06	3.5
(79)	5404	28.0	26.5	1.06	3.0
(80)		24.2	19.0(+)		3.0
(81)		23.2	22.2	1.05	2.3

* Deformed specimen

Although we have no bivalved specimen, the right valve must be smaller than the left valve judging from the general size of the both valves as enumerated in the table. The different sizes of the dorsal margins of the both valves suggest that they are not completely matched with each other even along the hinge-line.

The angle between the dorsal and the anterior margins of the anterior wing of the left valve is about 60° in the full grown specimen, but is smaller in the younger stage.

The fact that there is no bivalved specimens among the hundreds of very thin and yet well preserved specimens suggests that the ligament of this species is easily liable to damagement.

Comparison and remarks: The present form is quite similar to *E. multiformis* from the Lower Triassic deposit of Ussuriland (BITTNER, 1899, p. 10, pl. 2, figs. 15–22) in the height-length proportion, inclination of the shell, modes of the umbo and the wing parts, and the general convexity of the valve, but there are a few slight but innegligible differences between them. In the first place, the Ussuri form is slightly taller than the Shionosawa form, h/l being 1.11±7 in the latter and 1.17±6 in the former. In the second place, the position of the line of the maximum length in the left valve is slightly higher in the Shionosawa form than in the Ussuri one. Thus the ventral half of the shell outline appears rather slender in our form. In the third place, there seems to be slight difference in the mode of radial sculpture in the left valve. BITTNER (1899, op. cit.) describes that the left valve of *E. multiformis* bears the radial elements of different orders arranged in accordance with such a formula as 143424341 or 132313231, etc., although the formula is, in practice, more or less disordered. Fine radial striae in

our form, which approximately correspond to the ribs of 3rd and 4th orders in BITTNER's description, count 6–9 within the interspace between the stronger ribs in the mesial part and are evidently more numerous than those in the Ussuri forms, so far as BITTNER's description is concerned. When the Japanese form is compared with BITTNER's illustration, however, this difference appears not so evident. In well preserved specimens from Shionosawa the total number of radial ribs and the fine striae counts 15–16 within the breadth of 5mm at the distance of 20mm from the beak, which number is similar to that given in BITTNER's description. Indeed, the mode of manifestation of the complex radial elements are very hard, and this third difference must be checked, in future, by the comparison of actual specimens from the two districts. Lastly, it is pointed that the right valves of *E. multiformis* illustrated by BITTNER are, if correctly identified, evidently longer than high, while those of the Japanese form are higher than long. Considering the above-mentioned respects, the authors think it desirable to separate the Shionsawa form from *E. multiformis* of the Ussuri district as a new subspecies.

The dorsal margin of the left valve of *shionosawensis* is shorter than its shell-length, whereas BITTNER remarks "ihr Schlossrand ist lang, kaum kürzer als die Breite (Länge) der Klappe". This remark, however, is incorrect since the margin is evidently shorter than the shell-length in all the measurable specimens illustrated by BITTNER (1899, pl. 2, figs. 11, 15, 16, 17, 22, (20, 21)). Some specimens of *multiformis* from Ussuri (BITTNER, op. cit. pl. 2, figs. 18, 19) are similar to this subspecies in the height-length proportion, but is distinguished from it in the lower position of the line of the maximum length.

Based on the minor differences in the rib pattern KIPARISOVA (1938) distinguished three varieties among the Ussuri specimens of *multiformis*. None of them, however, agrees with *shionosawensis*. Var. *para* KIPARISOVA (1938, p. 287, pl. 3, fig. 1), whose ribs are arranged in accordance with such a formula as 1222221 or 133323331, may be nearest to *shionosawensis* so far as the larger number of radial striae is concerned, but that variety has the coarser and much more pronounced ribs of the 1st order than *shionosawensis*.

Very recently, NAKAZAWA (1953, p. 267, pl. 3, figs. 10a–b) described *Eumorphotis* sp., aff. *multiformis* from the Lower Triassic Yakuno group in Kyoto Pref., Southwest Japan. It is represented by a deformed left valve which is, when restored, supposed to be nearly as long as high, and as remarked by NAKAZAWA, differs from *multiformis* in the less developed radial system of sculpture and in the smaller height in proportion to the length. In this respect, it cannot be compared with *shionosawensis*.

E. multiformis from the Lower Triassic of Fukien, South China (CHEN, 1950, p. 91, pl. 1, fig. 10) which is also represented by a left valve, is somewhat allied to *shionosawensis*, but is taller and the exact comparison is impossible, since the Fukien specimen is too poorly illustrated.

Occurrence of "*Ps.*" *multiformis* was also reported by WIRTH (1936, p. 434) from the Lower Triassic of Szechuan, but the specimen has not been figured.

DIENER's *multiformis* from the Lower Triassic of Kashmir has nothing to do with this species, because it has the obtusely truncated anterior and posterior wings of the left valve which is not the

specific character of *multiformis* s.l. The present authors are not sure whether *multiformis* from *Süd Dolomiten* (OGILVIE-GORDON, 1927, p. 22, pl. 2, fig. 11) can be included within this species or not, because it does not possess the narrow umbo characteristic of *multiformis*.

MANSUY (1920, p. 36, pl. 5, fig. 3) illustrated a right valve from Nong Kong, Laos, and referred it to "*Ps.*" *multiformis*. Judging from the illustration, however, it is not taken for a *Eumorphotis*, since it bears no byssal notch. The associated ammonites indicate that the Nong Kong faunule is later than the Early Triassic in age.

Lastly, *E. multiformis* from the *Ophiceras* zone of East Greenland (SPATH, 1935, p. 74, pl. 22, fig. 8) is provided with finer and less strongly differentiated radial ribs than *shionosawensis*. The East Greenland form is better to be subspecifically separated from *multiformis* s. str. at the least.

E. multiformis is further described from the Lower Eo-Triassic of Wyoming (NEWELL & KUMMEL, 1942, p. 957, pl. 2, fig. 10). This American form differs from *shionosawensis* at least in its larger height-length proportion attaing 1.20 or even more.

Occurrence: The Shionosawa limestone at the entrance of the Kamakakezawa of Shionosawa, Ueno-mura, Tano-gun, Gumma-Pref. (群馬県多野郡上野村塩ノ沢)

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Postscript I

After the present paper had been completed, the senior author had the opportunity of reading the manuscript by H. OZAKI and T. SHIKAMA on "Three Skytic Molluscs from Gunma Prefecture, Central Japan" which is to be published in *Bull. Nat. Sci. Mus., N.S., vol. 1, no. 2* (*no. 35*). Also he examined their materials now deposited in the National Science Museum at Tokyo. For their kindness the present authors wish to express thanks to Dr. H. OZAKI of the National Science Museum at Tokyo and Prof. T. SHIKAMA of the Yokohama National University. Specimens of *Eumorphotis multiformis* illustrated by OZAKI and SHIKAMA are here referred to the subspecies described above. The right valve illustrated in fig. 1 (in OZAKI & SHIKAMA) shows the characteristic outline of this subspecies and the dotted line at the antero-ventral corner of the figure may better be omitted. The opisthocline attitude of the left valve illustrated in fig. 4 is clearly the result of the secondary deformation.

(October 3, 1954)

Postscript II

While the present paper is in press the following two papers by H. OZAKI and T. SHIKAMA appeared in *Bull. Nat. Sci. Mus., N.S., vol. 1, no. 2* (no. 35).

1. On the Lower Triassic Formation of Sionosawa Valley, Ueno-mura, Gunma Prefecture (in Japanese).

2. On Three Skytic Mulluscs from Gunma Prefecture, Central Japan (in English).

The Shionosawa formation defined in their first paper is different from the Shionosawa limestone defined in the present paper.

(Jan. 20, 1955)

Explanation of Plate 2

Eumorphotis multiformis (BITTNER) *shionosawensis* ICHIKAWA et YABE, new subspecies

Fig. 1. Right valve showing the outline of auricle. The ventral margin is not completely exhibited. (Reg. no. 5403) ×1

Fig. 2. Right valve showing the sculpture of the posterior auricle which is in turn unusually protruded posteriorly. (Reg. no. 5403) ×1

Fig. 3. Right valve showing the outline of auricles. The ventral portion is not preserved. (Reg. no. 5405) ×1

Fig. 4. Juvenile right valve. (Reg. no. OCU 252) ×1

Fig. 5. Left valve showing the characteristic anterior auricle and surface sculpture. (Reg. no. 5413) ×1

Fig. 6. Left valve showing the characteristic anterior auricle. (Reg. no. 5407) ×1

Fig. 7. Juvenile left valve. Auricles are not preserved. (Reg. no. 5408) ×1

Fig. 8. Left valve showing the anterior half of the narrow ligament area. The shell substance is preserved only in the ventral half where the characteristic sculpture of this subspecies can be well observed. Holotype (Reg. no. 5401) ×1

Fig. 9. Left valve. (Reg. no. 5409) ×1

Fig. 10. Left valve showing the characteristic posterior auricle. (Reg. no. 5410) ×1

Fig. 11. Right valve. The ventral portion is not preserved. (Reg. no. 5406) ×1

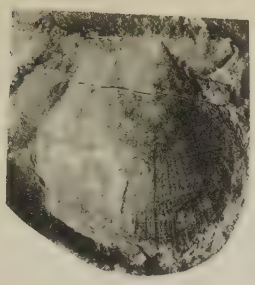
Fig. 12. Left valve showing the characteristic posterior auricle. (Reg. no. OCU 251) ×1

Fig. 13. Right valve showing the nearly complete outline. (Reg. no. 5402) ×1

Fig. 14. Left valve. (Reg. no. 5411) ×1

Fig. 15. Left valve. Somewhat prosocline attitude is possibly the result of the secondary deformation. (Reg. no. 5412) ×1

(Specimens illustrated in figures 4 and 12 are deposited in Osaka City University, all others in the Geol. and Min. Inst. Tokyo University of Education.)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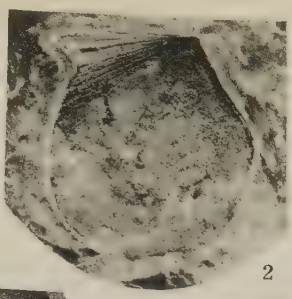
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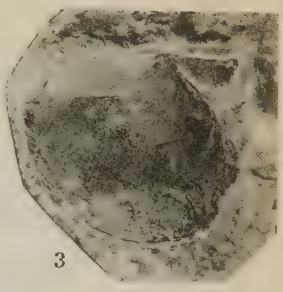
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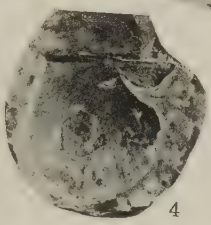
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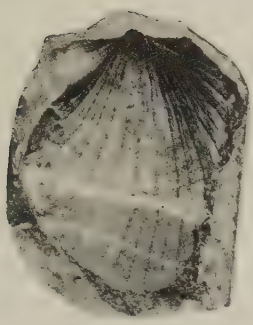
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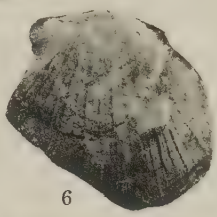
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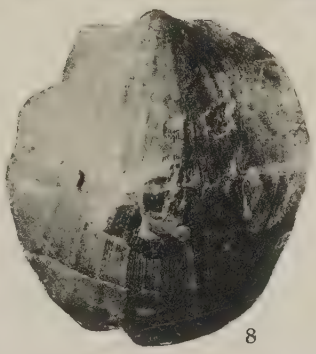
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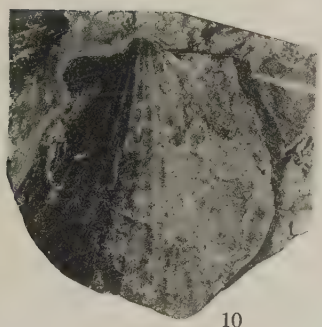
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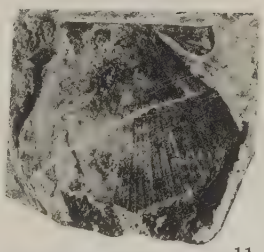
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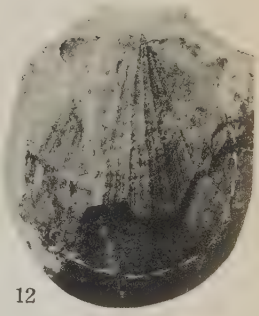
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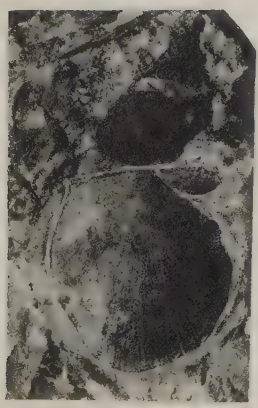
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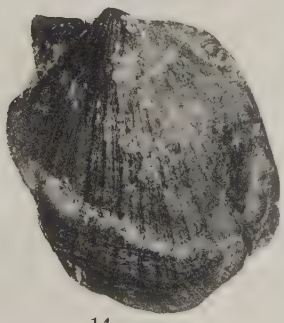
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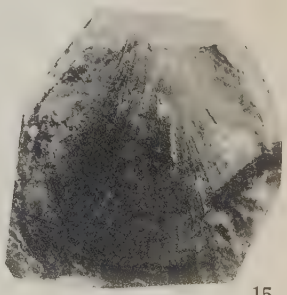
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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 17, pp. 13—18, 1 text-fig., Pl. 3, Apr. 10, 1955

260. DISCOVERY OF *GLYPTOPHICERAS* FROM HYOGO PREFECTURE, JAPAN*

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Geological and Mineralogical Institute, University of Kyoto

兵庫県から *Glyptophiceras* の発見：兵庫県宍粟郡富栖村字末広，中ノ谷から拾得された菊石を調べた結果，三畳紀最初期を示す *Glyptophiceras* に属する新種であることが分つた。附近は従来中生層とされているが精査の結果古生層であり，菊石の原産地は不明であつた。然し *Lepidolina toriyamai, Yabeina* cf. *yasubaensis* 等の紡錘虫を含む上部二畳紀層中に断層で小さいレンズ状にはさみこまれているものと判断した。この地域は舞鶴地帯の南縁部を示すものと推論し，併せて *Glyptophiceras* の新種を記載した。　中沢圭二・清水大吉郎

In reconstructing a path for carrying timbers in March 1953, K. KOBAYASHI has happened to find a cobble with a cast of an ammonite at Nakano-tani, Tomisu-mura,[1] about 8 km to the east of Yamasaki-machi, Shisô-gun, Hyôgo Prefecture. The sample kept in the Yasutomi Middle School at Anji-mura was donated to the collection of University of Kyoto through the courtesy of Mr. Keijun TATEBE of that school. Through this study, it is found to be a *Glyptophiceras* which has not yet reported in the Japanese Islands. In addition to its description some fusulinid species collected near that locality are illustrated. The writers wish to express their cordial thanks to Prof. S. MATSUSHITA of University of Kyoto for his kind advices, to assist. Prof. K. KANMERA of Kyushu University for his suggestions on the fusulinid species, to Messrs. K. TATEBE and K. KOBAYASHI for the donation and to Mr. F. KATO of University of Kyoto for photography.

* Read Dec. 19, 1953; received Oct. 31, 1954

1) 兵庫県宍粟郡富栖村字末広中ノ谷

Geological Note

The deposits in the neighbouring area of the fossil locality were taken for Mesozoic in age on K. KOCHIBE's geological map of Ikuno sheet in scale of 1/200,000 about 60 years ago. Since then no geological investigation on the area has been made. After the discovery of the ammonite, the writers visited the locality several times, and especially, the junior writer made a survey of the area in the scale of 1/5,000. The area consists of slate, sandstone, conglomerate, and liparite, of which the last occupying the summits of the mountains. The sedimentary rocks are classifiable as below; (see text-figure):—

Slate formation (I).....more or less sheared, black slate, sometimes intercalating small, thin, lenticular sandstone; more than 400 m. thick.

Sandstone formation (II) ..dark blue, fine to medium sandstone with intercalated, black, sometimes greenish slate; about 800 m. thick.

Slate and sandstone formation (III)... .....black slate and dark grey to dark blue sandstone in alternation, comprising fusulinid sandstone and conglomerate; exact thickness unknown.

The formation I is overlain by the formation II conformably, they strike in N 10° to 30°E and dip southeastward at 30° to 60°, forming a monoclinal structure. On the other hand, the formation III is variable in strike and dip, especially near the formation II, where the former is presumably in fault contact with the latter. The formation III contains in coarse sandstone a fusulinid fauna composed of *Yabeina* cf. *yasubaensis* TORIYAMA (Pl. 3, Fig. 8), *Yabeina* sp. [cf. *Y. columbiana* (DAWSON)] (Pl, 3, Figs. 5, 6), *Lepidolina toriyami* KANMERA (Pl. 3, Figs. 3, 4, 7), *Pseudodoliolina* sp. (Pl. 3, Fig. 9) and *Schwagerina* sp. (Pl. 3, Fig. 10); bryozoa? met with in a lenticular conglomerate composed of rounded pebbles of chert, sandstone, shale, limestone, metabasalt, and acidic igneous rocks.

In the fusulinid fauna and rock-facies of the formation it agrees well with those of the Upper Permian Kuma formation (KANMERA, 1953, 1954) in Kyushu and of the Maizuru group and its equivalents in the Maizuru zone (NAKAZAWA, 1950; NAKAZAWA, SHIKI and SHIMIZU, 1954; NAKAZAWA and SHIKI, 1954), that the formation is safely correlated to them.

Though the formations I and II are devoid of fossils, they are considered Paleozoic in age, or older than the formation I, from their rock-facies. The *Glyptophiceras*-bearing cobble has been obtained in the area of the formation III. Unfortunately, the writers could not find any outcrop of the Mesozoic strata which seemed to contain *Glyptophiceras*.

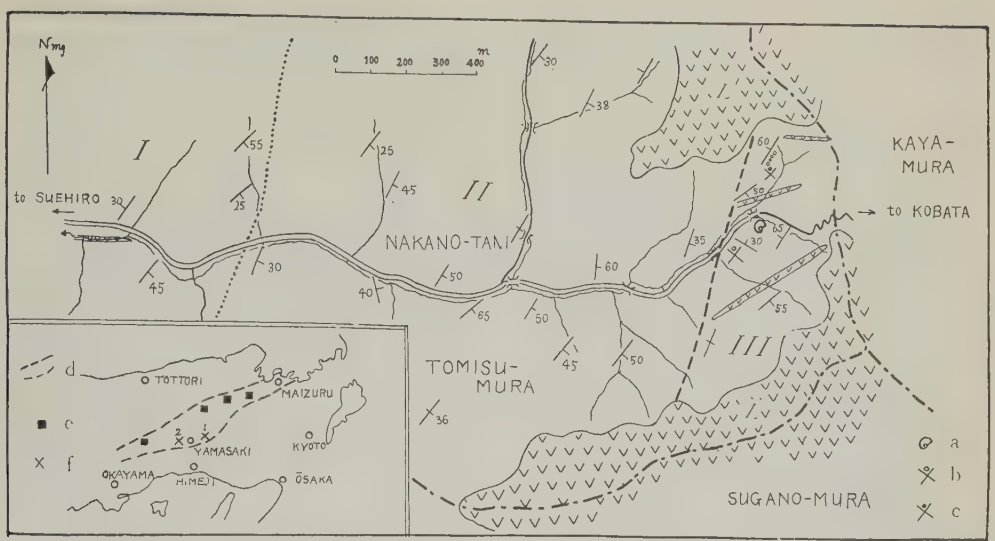
Occurence of *Glyptophiceras* and its meaning

The rock specimen under consideration is about 15 cm and 13 cm in diameter and 4 cm in thickness, consisting of hard, bluish black, finely laminated shale, and somewhat differs from the slate of the formation III in rock-feature. This has been digged out as a cobble from the river gravel under a small wooden bridge. The fossil is an external cast only, with no suture-line, but can be safely placed in the genus *Glyptophiceras* by the external characters which agree very well with those of the genus established by SPATH. The generic characters described by him are as follows (SPATH, 1930, p. 33).

> More or less evolute, round-ventered shell with suture-line like *Ophiceras*, but with coarse sigmoidal costation, tending to degenerate into striation.

As already stated, the writers could not detect the original locality from which the gravel had been derived, but were obliged to consider from the occurrence that the strata sought for were shut in somewhere in the formation III as a small lens.

The genus *Glyptophiceras* was considered to be confined to the lower division of the lower Eo-Triassic, i. e. Otoceratan (and Lower Gyronitan?) by SPATH (1934, p. 81). Its distribution is restricted to the Himalayas and East Greenland as far as the writers are aware though the intimate genus *Ophiceras* (s.l.) is much more widely distributed. *Glypto-*



Textfigure. Geological sketch map of the Nakano-tani area. I: Slate formation, II: Sandstone formation, III: Sandstone and slate formation, L: Liparite, a, b, c: Fossil localities of *Glyptophiceras*, fusulinids and bryozoa? respectivelly, d: Maizuru zone, e: Distribution of Inai series, f: Fossil locality of ammonites (1: Nakano-tani, 2: Koge).

phiceras japonicum described below as new species is more closely related to the Himalayan species than to the East Greenland. In Japan, the Lower Triassic formations are much limited in distribution, namely, to the lower parts of the Inai series in the southern Kitakami mountainland and in the Maizuru zone, the Iwai formation at Itsukaichi near Tokyo, the Shionosawa formation in the Kwanto mountainland, the Kurotaki and the Tao formations in Shikoku. They can be grouped into two in rock-facies, although they are not strictly correlated with one another. The formations of one group are several hundred meters thick, and are composed mainly of sandstone and conglomerate, are rich in pelecypod fossils, and are distributed over a fairly large area. They resemble the Lower Triassic formation of Ussuriland in facies and fauna. The formations of the other group are several scores of meters thick, composed mainly shale and limestone, and distributed as small patches, and some are rich in cephalopod fossils. The first group includes the lower parts of the Inai series in the Kitakami mountainland and in the Maizuru zone, and the second includes the rest. The supposed "*Glyptophiceras* bed" under discussion may belong to the latter group.

Among them the Tao formation is referred to Middle Eo-Triassic from *Anasibirites-Meekoceras* fauna (Shimizu and Jimbo, 1933). The lowest part of the Inai series as well as the Kurotaki and Shionosawa formations are considered to be Lower Eo-Triassic Tatean in age mainly from their pelecypod faunas resembling that of Ussuri beds (Ichikawa, 1949, 1950), but have not yet been confirmed to go down to Otoceratan in age owing to the scarcity of cephalopod fossils. Only the Iwai formation

containing *Ophiceras* sp. nov. aff. *demissum* (OPPEL) in SPATH and other fossils is referable to that age (SHIMIZU, 1932). Recently the senionr writer found *Ophiceras* (s.l.) sp., *Xenodiscus*? sp., *Claraia* aff. *decidens* and other fossils from the lower part of the Yakuno group (NAKAZAWA, 1953), and *Ophiceras*? sp., *Pseudosageceras* aff. "*intermonatanum*" HYATT and SMITH from the Kusano formation of the Fukumoto group (NAKAZAWA, SHIKI and SHIMIZU, 1954) in the Maizuru zone. It is highly probable that the Inai series in this zone contains the lowest horizon of the Trias. It is noteworthy that the specimen has been found in the area of the Upper Permian formation of *Lepidolina-Yabeina* zone, which is, like the Triassic formation, a characteristic constituent of the Maizuru zone. Moreover the Lower Triassic formations in this zone are generally coarse grained near the northern border, while they show a tendency to become finer-grained southward. From these points, it is considered that the area where the ammonite under consideration has been obtained indicates the southern border of the Maizuru zone and that the "*Glyptophiceras* bed" represents the lowest part of the Inai series in this zone. A few years ago, the junior writer obtained a pebble with an ammonite which had been picked up by a schoolboy of the Yamasaki High School from the cultivated land at Kôge about 5 km WNW of Yamasaki-machi. It is composed of bluish black shale very similar to the shale with *Glyptophiceras*, but the ammonite is so eroded that it can not be indentified. Unfortunately its original locality, too, could not be confirmed, but the strata around the pebble-locality are very much like those of the locality of the subject in question. It can be expected that the Lower Triassic strata will be found along the southern border of the Maizuru zone.

Description of Species

Ammonoidea

Family Ophiceratidae, ARTHABER, 1911 em. SPATH, 1930

Genus *Glyptophiceras* SPATH, 1930

Glyptophiceras japonicum NAKAZAWA and SHIMIZU, n. sp.

Pl. 3, Figs. 1a, b, and 2

Diagnosis: An external cast is at hand from a cobble of an unknown Mesozoic formation. Its dimensions are as follows:

	G. japonicum	Holotype of *G. himalayanum*	Holotype of *G. gracile*
Diameter	57mm.*	40mm	47mm
Height of the last whorl	16* 28% (of diameter)	35% (of diameter)	32% (of diameter)
Thickness of the last whorl	9* 16% („)	16% („)	26% („)
Umbilicus	28 50% („)	40% („)	47% („)

* Measurements are approximately estimated, because the ventral margin is not preserved.

Shell moderate in size, slightly involute, whorls compressed, whorl section convergent, with, perhaps, narrowly arched venter judging from the section of its gypsum mould (Pl. 3, Fig. 2), umbilical wall rather steep, flank very gently convex, with maxium breadth at the umbilical rim, umbilicus fairly large and shallow. Surface ornamention indistinct at a diameter below 5 mm, then consisting of comparatively distant bulges gradually changing to rather distant sigmoidal costae, and becoming closer in advanced growth and at last changing suddenly to fine striae. Suture-line unknown.

Remarks and Comparison: This specimen is represented by an external cast only with no suture-line, but is surely referred to *Glyptophiceras* by its characteristic ornamentation, coiling, and whorl-section. This species has a close resemblance to *Glyptophiceras gracile*, especially, its holotype specimen (SPATH, 1930, p. 34, Pl. VII, Figs. 5a, b) in ribbing and coiling, but clearly distinguished from the latter by the more compressed and subtrigonal whorl-section like *Ophiceras* s.s. type. In this point it has a closer affinity to the Himalayan species, *G. himalayanum* (GRIESBACH) (GRIESBACH, 1880, p. 111, Pl. III, Fig. 8; DIENER, 1887, p. 41, Pl. XIV, Figs. 14 a, b, c), but differs from the latter in the larger umbilicus and more closely-set ribbing. (Reg. No. JM. 10111).

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Explanation of Plate 3

Glyptophiceras japonicum NAKAZAWA and SHIMIZU, n. sp.

Fig. 1a.....External cast of holotype, ×1.

Fig. 1b.....Gypsum mould of the same, both sides of a crack being united, ×1.

Fig. 2.....Restored whorl-section from the gypsum mould, ×1.

All figures below are ×10.

Lepidolina toriyamai KANMERA

Fig. 3, sagittal section; Fig. 4, oblique axial section

L. cf. *toriyamai* KANMERA

Fig. 7, diagonal section.

Yabeina sp. [cf. *Y. columbiana* (DAWSON)]

Figs. 5, 6, slightly excentric sagittal sections.

Yabeina cf. *yasubaensis* TORIYAMA

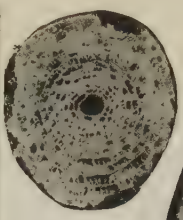
Fig. 8, axial section (outer volution being destroyed)

Pseudodoliolina sp.

Fig. 9, parallel section.

Schwagerina sp.

Fig. 10, tangential section.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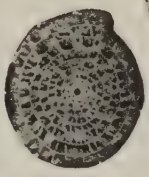
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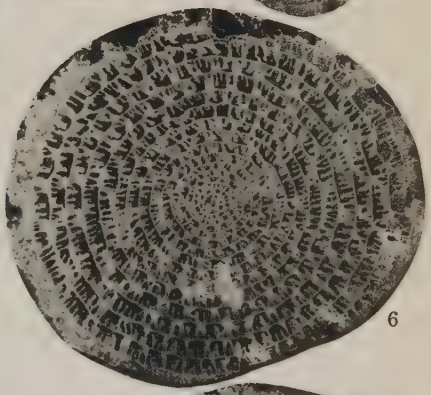
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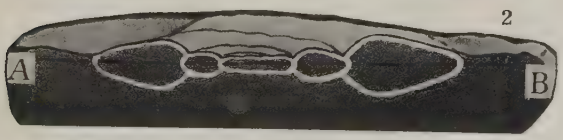

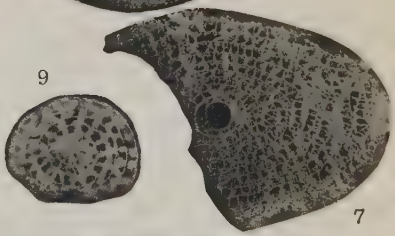
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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 17, pp. 19-22, Pl. 4, Apr. 10, 1955.

261. NON-MARINE MOLLUSCA FROM THE PALEOGENE UCHIGO GROUP OF THE JOBAN COAL-FIELD, NORTHEAST HONSHU, JAPAN*

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常磐炭田内郷層群より非海棲貝化石の発見： 従来常磐炭田の新生代層よりは数多くの海棲又は汽水棲貝化石の産出が報告されているが，本報文では始めて発見された非海棲貝化石について述べる。内郷層群（漸新世）下部の白水夾炭層より *Corbicula tokudai* (YOKOYAMA)（茨城県多賀郡関本村水上産）を，又石城砂岩層より *Anodonta subjapanensis yokoyamai* SUZUKI（福島県石城郡上遠野村滝及び同郡好間村大畑産）を得た。前者は北海道石狩層群や雨竜層群より普通に産出する種であり，又後者は雨竜層群と阿武隈山地北縁部の中新世大沢層より産出が報ぜられている。 鎌田泰彦

Although there are numerous reports bearing on the occurrence of marine and brackish-water molluscs from the different formations of the Joban coal-field, the present paper records the first discovery of non-marine shells from the coal-field.

The non-marine shells were collected by the writer and Mr. Shun-Ichi SUZUKI from the Iwaki sandstone and Shiramizu formation of the Oligocene Uchigo group, the oldest Tertiary sediments in the coal-field. The occurrence of the non-marine shells serves to throw additional light on the paleoecology and environment under which they were entombed. The non-marine shells were collected from three localities, one belonging to a coal-bearing formation generally ascribed to the Shiramizu formation, and two to the Iwaki sandstone. They comprise one species and one subspecies, namely, *Corbicula tokudai* (YOKOYAMA), and *Anodonta subjapanensis yokoyamai* SUZUKI.

Corbicula tokudai was first described by M. YOKOYAMA in 1932 under the generic name of *Circe*, but the subsequent studies of K. SUZUKI (1941-a) which were based on a study of the hinge characters, proved its reference to the genus *Corbicula*. He (SUZUKI, 1941-a, b) stated that the species is one of the most common corbiculids in the Paleogene Ishikari group of the Ishikari coal-field and also in the Uryu group of the same age in the Uryu coal-field. This fact was subsequently upheld by T. NAGAO and K. OTATUME (1943), and by K. OTATUME (1943).

Previous records show that the species has been restricted to Hokkaido in its distribution, but the present discovery now extends its distribution to the main island of Japan. The specimens of *Corbicula* from the Joban coal-field were collected from the upper course of the Satone River, Mizugami, Sekimoto-mura, Taga-gun, Ibaragi Prefecture.

The *Corbicula* bed of the above-

* Read Feb. 28, 1953; received Oct. 15, 1954.

mentioned locality consists of massive, dark green, medium grained sandstone, one meter thick and contains sporadically angular pebbles of green-colored amphibole-schist of the basement complex. The sandstone containing accumulated shells of *Corbicula* in its middle part, overlies an oyster bank comprising shells of *Ostrea takiana* YOKOYAMA. The two shell beds in the present area occupy a position in the lower part of the Shiramizu formation. The Shiramizu is overlain conformably with the Iwaki sandstone and Shirasaka shale successively; all four formations belong to the Uchigo group.

Anodonta subjapanensis yokoyamai was originally described by K. SUZUKI (1941) on specimens from the Oligocene Uryu group of the Uryu coal-field in Hokkaido. Subsequently it has been reported from the Miocene Osawa formation in the northern part of the Abukuma massif in northern Fukushima Prefecture, and the present record is its second outside of Hokkaido.

The subspecies was collected from two localities, one from the large cliff about 200 meters east of Taki, Kadônomura, and the other from Ohata, Yoshima-mura, both in Iwaki-gun, Fukushima Prefecture. The specimens from the first locality, or at Taki, were collected from concretions embedded in the gray siltstone in which such plant remains as *Sequoia* also occur. *Comptoniphyllum* also occurs from the same cliff, according to verbal information from Mr. Fusao UEDA, who previously surveyed the area, but the writer was unable to collect it. About twelve meters stratigraphically below the non-marine shell bed just mentioned, there occurs a sandstone bearing many brackish-water or marine shells as *Ostrea takiana* YOKOYAMA, *Trapezium*, *Cyclina* and *Glycymeris*. Although there is no development of the marine Asagai and Shirasaka formations in the present area, it is believed that the shell-beds just mentioned may belong to the lower part of the Iwaki sandstone from both stratigraphical and paleontological evidence. Details of this evidence will be presented in another article.

The specimen from the second locality or Ohata, is from a gray siltstone in which were found ramains of *Glyptostrobus*, *Sequoia*, *Ficus* and *Carpinus* (?). This horizon occupies the middle part of the Iwaki sandstone in the Yoshima area of the central part of the coal-field. The specimen compared with the others from the first locality, is considerably larger and apparently of thinner test, but of the same external characteristics. Probably the differences shown in the size and thickness of the test may have close relation with ecological conditions which may have been slightly different owing to geographical position with the same district.

Before going remarks on the species, the writer wishes to express his cordial thanks to Professors Shoshiro HANZAWA, Motoki EGUCHI and Kotora HATAI of the Tohoku University, Sendai, for their constant encouragement and for kindly reading the manuscript. Acknowledgements are also due to Mr. Shun-Ichi SUZUKI, a graduate student of the Mining Department, Faculty of Technology, Tohoku University, for kindly donating his specimen from Ohata to the writer's study. Thanks are due to Messrs. Yû HIGUCHI and Kôzô NAKAJIMA for their assistance in the field, and to Messrs. Kimiji KUMAGAI and Jyû SATÔ for the preparation of photographs.

Family Corbiculidae

Genus *Corbicula* MERGELE, 1811

Corbicula tokudai (YOKOYAMA)

Pl. 4, figs. 4-9.

Circe tokudai YOKOYAMA, 1932, *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, vol. 3*, pt. 6, p. 240, pl. 2, figs. 3, 4.

Corbicula atrata tokudai SUZUKI, 1941, *Ibid., Sec. 2, vol. 6*, pt. 1, p. 9, text-figs. 1, 2, pl. 1, figs. 11, 12, pl. 2, figs.1-26; SUZUKI, 1941, *Ibid. Sec. 2, vol. 6*, pt. 2, p. 32, pl. 2, figs. 6-12.

Corbicula tokudai NAGAO and OTATUME, 1943, *Jour. Fac. Sc., Hokkaido Imp. Univ., Ser. 4, vol. 7*, no. 1, p. 7, no. 1, pl. 3, figs. 4-9; OTATUME, 1943, *Ibid. Ser. 4, vol. 7*, no. 1, p. 16, text-fig. 4; OTATUME, 1943, *Jour. Geol. Soc. Japan, Vol. 50*, no. 599, p. 220; SUZUKI, 1949, *Japan. Jour. Geol. Geogr., Vol. 21*, nos. 1-4, p. 121.

Remarks:—Although, most of the specimens in the present collection are broken and more or less deformed by subsequent pressure, they are safely identified with the holotype described by M. YOKOYAMA (1932) from the Uryu coal-field in Hokkaido. Most of the specimens are somewhat longer than high, roundly pentagonal in outline, with obliquely subtruncated posterior margin, and a blunt edge runs from the beak to the postero-ventral corner. The shell surface is almost smooth except for fine, incremental concentric growth lines. The present specimens are smaller than those figured by K. SUZUKI (1941-a, b) and T. NAGAO and K. OTATUME (1943) from the Ishikari and Uryu coal-fields is Hokkaido. The differences in size between the present and Hokkaido specimens may be due to geographical position, or in other words, to different enviromental conditions.

Measurements:—(in mm)

Length	Height	Width	Valve
ca. 23.0	21.2	8.0	Right
22.5	ca. 19.0	7.9	Left
22.4	20.9	8.0	Right
20.4	18.3	6.2	Right
18.2	17.7	6.3	Left

Locality and formation:—Mizugami, Sekimoto-mura, Taga-gun, Ibaragi Prefecture. (Ogawa) Lat. 36° 51′ 24″ N., Long. 140° 43′ 45″ E. Shiramizu formation, Oligocene. IGPS* coll. cat. no. 74007. Y. KAMADA coll.

Family Unionidae

Genus *Anodonta* LAMARCK, 1799

Anodonta subjapanensis yokoyamai SUZUKI

Pl. 4, figs. 1, 2a-b, 3.

Nodularia cf. *biwae* YOKOYAMA, (not KOBELT, 1879; part) 1932, *Jour. Fac. Sci.. Imp. Univ. Tokyo, Sec. 2, vol. 3*. pt. 6, p. 243, pl. 4, fig. 4.

Anodonta subjapanensis yokoyamai SUZUKI, 1941, *Ibid., Sec. 2, vol. 6*, pt. 2, p. 29, pl. 2, figs. 3a-c; SUZUKI, 1949, *Japan. Jour. Geol. Geogr., Vol. 21*, nos. 1-4, p. 121; KANNO, 1954, *Sci. Rep. Tokyo Kyoiku Daigaku, Ser. C, vol. 3*, no. 19, p. 83, pl. 6, fig. 9.

Remarks:—As already mentioned above, the three specimens of this subspecies were collected from two localities in the Joban coalfield, from Taki and the other from Ohata. Compared with the type specimens from the Uryu coal-field in Hokkaido which was described by K. SUZUKI, the Joban specimens are much larger, especially the left valve from Ohata is more than three centimeters longer. Although having a larger shell,

* IGPS; abbreviation for Institute of Geology and Paleontology, Sendai.

they are safely identified with the type subspecies. The present specimens are tansversely subelliptical in outline, have a long dorsal margin which forming an obtuse but fairly distinct posterior angle, a long and moderately straight ventral margin which is subparalled to the dorsal, and an indistinct posterior ridge.

Measurements:—(in mm)

Length	Height	Valve
68	40	Both (Taki specimen)
60	37	„ („)
83	5	Left (Ohata specimen)

Localities and formation:—

1) About 200 m east of Taki, Kadônomura, Iwaki-gun, Fukushima Prefecture. (Ogawa) Lat. 36° 58′ 46″ N., Long. 140° 44′ 40″ E. Iwaki formation, Oligocene. IGPS coll. cat. no. 74003. Y. KAMADA coll.

2) Ohata, Yoshima-mura, Iwaki-gun, Fukushima Prefecture. (Taira) Lat 37° 03′ 18″ N., Long. 140° 49′ 54″ E. Iwaki formation, Oligocene. Mining Department, Tohoku University Reg. no. 4. S. SUZUKI coll.

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—— (1943-b) The Fossil Corbiculids from Hokkaidô and Karahuto. *Jour. Geol. Soc. Japan, Vol. 50*, no. 599, pp. 216–222, 2 text-figs.

SUZUKI, K. (1941-a) Some Non-Marine Shells from the Oligocene Ishikari Series in the Ishikari Coal-Field, Hokkaido. *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, vol. 6*, pt. 1, pp. 1–11, 2 text-figs., 2 pls.

—— (1941-b) Notes on the Tertiary Non-Marine Mollusca from the Coal-Field of Uryu, Hokkaido. *Ibid., Sec. 2, vol. 6*, pt. 2, pp. 13–37, 1 text-fig., 2 pls.

—— (1941-c) On the Tertiary Non-Marine Shells Illustrated in K. JIMBO's "Hokkaidô Tisitu Ryakuron (Geological Sketch of Hokkaidô)", 1890. *Jour. Geol. Soc. Japan, Vol. 48*, no. 578, pp. 520–525, 6 text-figs.

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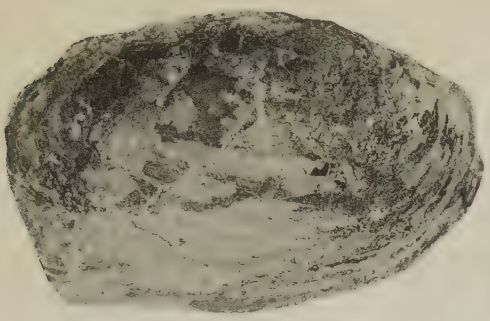
Explanation of Plate 4

Figs. 1–3, *Anodonta subjapanensis yokoyamai* SUZUKI
Figs. 1, 2a-b: Loc. Taki, Kadono-mura, Iwaki-gun, Fukushima Prefecture.
Fig. 3: Loc. Ohata, Yoshima-mura, Iwaki-gun, Fukushima Prefecture.
Figs. 4–9, *Corbicula tokudai* (YOKOYAMA)
Loc. Mizugami, Sekimoto-mura, Taga-gun, Ibaragi Prefecture.

(all figures in natural size)



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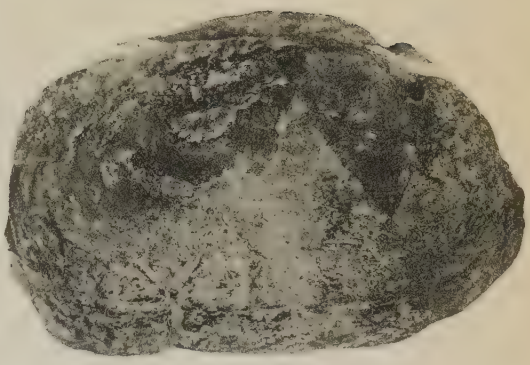

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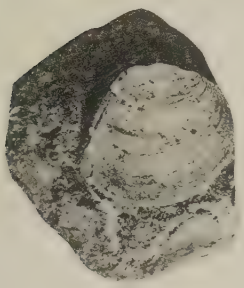

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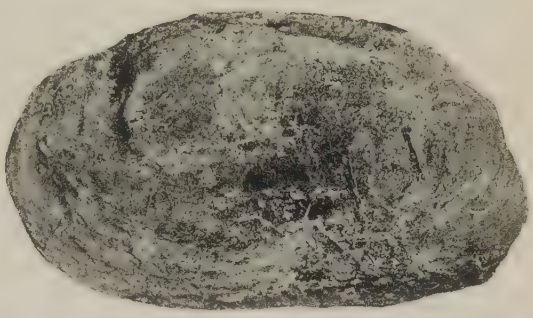

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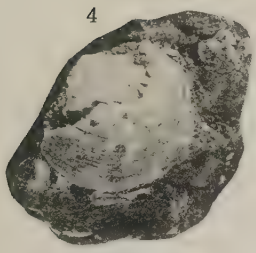

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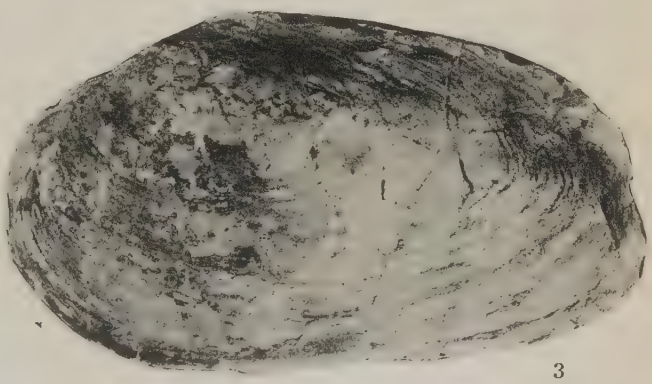

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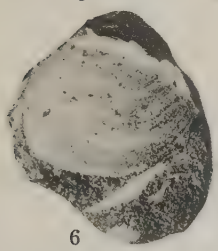

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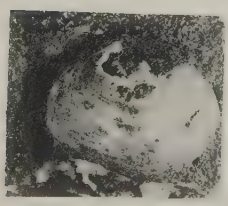

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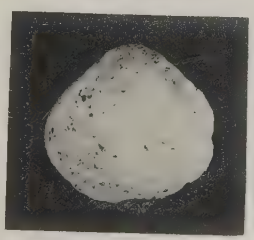

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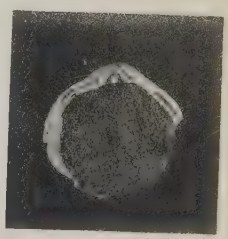

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Photo. by KUMAGAI and SATO

Trans. Proc. Palaeont. Soc. Japan, N.S. No. 17, pp. 23—28, Pl. 5, Apr. 10, 1955.

262. OCCURRENCE OF A NEW SPECIES OF *PLEURONECTITES* IN THE TRIASSIC OF JAPAN.*

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日本三畳系中の *Pleuronectites* 一新種の産出：本属の分布は殆どヨーロッパに限られていた。東亜では土佐，黒滝産の二個が唯一のものであつたが，美弥統平原層より新種を産出したのでそれについて記載した。　天野昌久

Ignoring Palaeozoic species, whose generic references are dubious, *Pleuronectites* comprises 5 or more species all known from the Triassic in Europe. Therefore its occurrence in the Far East is new to the science. *Pleuronectites hirabarensis*, is proposed for this Japanese form. The specimens belong to the collection of the Geological Institute, University of Tokyo. The writer wishes to record here his hearty thanks to Prof. KOBAYASHI of the University, for his kind guidance and reading the manuscript and to Prof. ENDO and Prof. MATSUMOTO of Kumamoto University for their encouragements.

Family Pectinidae LAMARCK

Genus *Pleuronectites* SCHLOTHEIM

Diagnosis:—Shell highly inequivalve, pallial surface almost perfectly smooth, except for feeble concentric striae. Right valve inequilateral with rectangular anterior ear, whose anterior margin is mostly sigmoidal; byssal notch deep and ctenolium frequently present. Left valve almost equilateral and a little more convex than the right.

* Read Oct. 9, 1954; received Oct. 27, 1954.

Type species:—*Pleuronectites laevigatus* SCHLOTHEIM.

Remarks:—Although the literatures accessible to the writer are limited, *Ostracites Pleuronectites laevigatus* SCHLOTHEIM and *Ostracites Pleuronectites discites* SCHLOTHEIM may be two of the oldest (v. SEEBACH, 1861). The former was referred to *Pecten* by BRONN (1829), and identified by GOLDFUSS with *Pecten vestitus* GOLDFUSS.

According to v. SEEBACH (1861), *Ostracites Pleuronectites discus* and *Ostracites Pleuronectites decussatus* SCHLOTHEIM belong most probably to *Pecten discites* BRONN. V. STROMBECK (1849) quoted that "Unter dieser Species (=*Pecten discites* BRONN) werden sämmtliche nicht zu *Pecten laevigatus* gehörige glatte im Muschelkalke bekante *Pecten* zusammengefasst." These statements suggest that several *laevigatus*-like *Pecten* were called by the name of *Pecten discites* BRONN. The general character of *discites* is said by v. STROMBECK (1849) to be equi- or nearly equivalve, and one variety has impressions radiating from the beak to two sides. PHILIPPI's figure (1900) shows the existence of strong cardinal ridges between the ears and the main part of the

shell in its inner surface. Therefore *discites* may be excluded from *Pleuronectites.*

Pleuronectites (?) sp. reported by PHILIPPI (1904) from Predazzo, Italy, is similar to TORNQUIST's *Pleuronectites beyrichi.* This probably differs from *Pleuronectites* as PHILIPPI himself assigned a question-mark, because the posterior half from the vertical line through the beak is larger than the anterior, and very fine radial lines are recognized on the shell surface by a lupe.

Two *Pleuronectites* are reported from the Palaeozoic, namely, *Pecten* (*Pleuronectites*) *devonicus* FRECH from Germany and *Pleuronectites monoliden* MERLA from Italy. They, however, may be eliminated from *Pleuronectites* by the reason that the former is only the left valve, which is equilateral, with numerous radial ribs in the intervals among the fine concentric lines. The reference of *Pecten* (*Pleuronectites*) *devonicus* to *Pleuronectites* is questioned by SALOMON (1895). Of the latter, the figure and description are inaccessible to the writer.

Pecten (*Streblopteria*) *laterestriatus* was first reported by PHILIPPI (1899) with the thought of its being an intermediate form between *Streblopteria* and *Pleuronectites.* It is quite different from *Pleuronectites* in the existence of radial furrows near the marginal area, inequilaterality of the left valve, and the form of the right anterior ear. Nevertheless, this is *Pleuronectites*-like *Pecten* as stated by PHILIPPI. SCHMIDT has called the same species as *Pecten* (*Pleuronectites*) *laterestriatus.*

Pecten (*Leptochondria*) *aeolicus* BITTNER (1892) from Asia Minor was identified with *Pleuronectites alberti* GOLDFUSS by TORNQUIST (1900). These two are equilateral, and provided with two sets of radial ribs which seem to be an essential specific character. TORNQUIST has noted on radial ribs on the shell surface of *Pleuronectites.* Because the radials of *Pleuronectites* are not essential for the genus, however, the *alberti*-form is thought to be probably eliminated from the *Pleuronectites.*

FRECH is of opinion that *Pleuronectites* SCHLOTHEIM em. FISCHER is synonymous with *Streblopteria* M'COY and proposed the name of *Pleuronectites prolaevigatus* for *Streblopteria laevigata* M'COY. But, as noted by SALOMON (1895), it is evident that *Pleuronectites* differs from *Streblopteria,* in having a deep byssal notch and ctenolium. After NEWELL, the vertical range of *Streblopteria* M'COY is from lower Carboniferous to Permian (?).

The writer could not see any reference to *Pecten compressus* reported by STOPPANI. According to SALOMON, it is probably a *Pleuronectites,* because it is so close to *Pleuronectites laevigatus* as presumed a young of the species.

List of species:—In-so-far as the writer can judge with references, the followings belong to this genus.

1) *Pleuronectites beyrichi* TORNQUIST, (1899), from Oberhalb Fantoni in Monte Spitz & Unterhalb San Rocco in Tretto, Italy.
2) *Pecten compressus* STOPPANI, (1860), from Ladinic of South Alps. (SALOMON, 1895, & DIENER, 1923).
3) *Pleuronectites laevigatus* SCHLOTHEIM, by SALOMON (1900), from Nodosuskalk of Neckar and Wellenkalk (?) of Elsenz, Schwarzwald.
4) *Pecten* (*Pleuronectites*) *laevigatus* SCHLOTHEIM, by PHILIPPI (1900), from Muschelkalk of Weimar and Muschelkalk of Seeberg near Gotha, Thüringen, and by SCHMIDT (1928), from mitt. Wellengebirge, Schwarzwald.
5) *Pecten laevigatus* SCHLOTHEIM, by ECK

(1862), from Muschelkalk of Oberschlesien, and by NOETLING (1880), from Muschelkalk of Niederschlesien.

6) *Pecten laevigatus* BRONN, by STROMBECK (1849), from Muschelkalk of N.W. Germany, and by SEEBACH (1861), from Muschelkalk of Weimar.
7) *Pecten* (*Streblopteria*) *laterestriatus* PHILIPPI, (1899), from Muschelkalk of Saargebiet.
8) *Pecten* (*Pleuronectites*) *laterestriatus* PHILIPPI, by SCHMIDT (1928), from the same as the preceding.
9) *Pecten schmiederi* GIEBEL, by SEEBACH (1861), from Muschelkalk of Weimar.
10) cf. *Pecten schmiederi* GIEBEL, by AHLBURG (1906). from Wellenkalk of Oberschlesien.
11) *Pecten* (*Pleuronectites*) *schmiederi* GIEBEL, (1856), from unt. Muschelkalk of Lieskau, (SCHMIDT, 1928).
12) *Pleuronectites* spp. by MATSUSHITA (1925), from lower Trias of Kurotaki, Tosa.

Distribution:—It needs a more thorough revision to figure out an exact spatio-temporal range of the genus. It is, however, certain from the above list, that the genus including its type species has most flourished in the Muschelkalk. It occurs also in the South Alps and Japan.

Pleuronectites hirabarensis n. sp.

Plate 5, Figures 1–7.

Description:—Shell higher than long, inequivalve, and inequilateral especially in the right valve.

Right valve subcircular, but anterior margin is more expanded anteriorly than the other and antero-dorsal a little concave, very inequilateral; a half anterior to the vertical through umbo larger. Umbo more or less pointed, not projected above hinge line; umbonal angle about 90 degrees. Anterior ear larger than the posterior, laterally elongated, subrectangular; hinge margin slightly concave upwards; anterior margin sigmoidal; distinct carina stretching from near the umbo to antero-ventral corner, gradually thickened distally; growth striae sigmoidal; ventral margin bent up a little, separated from the main part of shell by deep byssal notch; a row of small holes aligned on the inner margin of the sinus, probably indicating ctenolium. An obliquely striated, lanceolate area forms the inner wall of the sinus, angulated at the top. The angulation, however, dies out on the anti-umbonal side. Posterior ear small, triangular, ill-defined; growth striae fine, parallel to posterior margin. Umbonal area a little convex, while the remainder is nearly flat. Surface almost smooth but 2 or 3 concentric furrows may be present; with a binocular, feeble concentric striae occasionally seen near the margin.

Left valve obliquely oval, almost equilateral, but a half anterior to the vertical through the umbo is a little larger than the posterior. Two ears triangular, nearly equal (?) in size; growth striae fine, subvertical. Although the border with the main part of the shell is distinct near the umbonal region, the linear walls are obscure as on the right valve. Umbo somewhat pointed, elevated a little above straight hinge line; umbonal angle about 90 degrees; umbonal area convex, but gradually flattened toward the pallial margin. Surface smooth; concentric growth striae seen near the margin.

Measurements:	Holotype (right v.)	Holotype (left v.)	Paratype (right v.)
Height	ca. 35 mm.	ca. 29 mm.	ca. 39 mm.
Length	ca. 31 mm.	ca. 27 mm.	ca. 34 mm.

Observation:—The left valve is usually more convex than the right. On the specimen in figs. 6-7, a series of small holes is seen below the anterior ear. They may be the traces of the ctenolium. Growth striae are usually seen clearly on the ears but obscure in the main shell. With a magnifer, however, concentric striae can be seen in some specimens near the margin.

Occasionally 2 or 3 oblique ribs are recognized within a narrow furrow along dorsal margin of the right anterior ear.

Most specimens before hand are secondarily deformed in different degrees and manners. The outline of a specimen in fig. 5, was badly so depressed that it became longer than high and geniculated near the posterior and ventral margins. The crape-like wrinkles clearly visible in the paratype in fig. 2, are disposed radially. They are probably due to the thin shell.

Comparison:—At a glance, the outline of this species reminded the writer of *Camptonectes*. But the surface ornamentation typical of *Camptonectes* cannot be seen on it. The distinct, antero-dorsal linear wall and the arcuate hinge margin seem to show the characteristics of *Entolium*. On the other hand, it coincides with European *Pleuronectites* in the inequivalved and inequilateral shell, arcuate hinge margin with upward concavity, deep byssal notch under the right anterior ear, larger convexity of the left valve than of the right, and the simple ornamentation on the shell surface, although those are never seen on *Entolium*. Thus, it is certain that this species resembles more *Pleuronectites* than any other genus. Judging from the *Entolium*-like characters and the speciality of the sculpture of right anterior ear, however, it is not improbable to reveal a new genus by itself. The decision is left over until better specimens will be procured.

Pleuronectites beyrichi TORNQUIST from Tretto, Italy, differs from the present species in the subsymmetrical outline and the large apical angle of the right valve and the remarkably inflated left valve.

The closest ally to this species is *Pleuronectites laevigatus* SCHLOTHEIM, especially in fig. 338-b on p. 158 of "Die Lebewelt unserer Trias" by SCHMIDT, but is still distinct in the more protruded anterior margin, more circular outline and in the anterior ear of the right valve. The moderately inflated umbo is protruded above the hinge line in the left valve of that species. In *Pecten laevigatus* BRONN from Weimar 8 or 16 "Farbenstreifen" are said by v. SEEBACH to exist rarely on the left valve. In the description of *Pleuronectites beyrichi*, TORNQUIST said that *Pleuronectites laevigatus* in good preservation has the distinct radial striae on the right valve. Judging from these statements and illustrations of *Pleuronectites laevigatus* by several authors, there may be 2 or more varieties in that species.

Among Japanese species, "*Velata*" *sumeriensis* KOBAYASHI and ICHIKAWA from the upper Triassic in Sakawa basin is most similar to this. It may be a *Pleuronectites*, although the ctenolium can not be seen. It is specifically different from *Pleuronectites hirabarensis* in having fine and indistinct radial lines, straight hinge margin, anteriorly truncated anterior ear and the longer outline of the shell.

This appears to resemble *Camptonectes triadicus* NAKAZAWA and *Velata maizurensis* NAKAZAWA from the upper Triassic Nabae Group, and *Camptonectes torino-*

suensis KURATA and KIMURA and *Entolium japonicum* KURATA and KIMURA from the Jurassic of Sakawa basin in one or the other aspect, but they are generically distinct from this species.

MATSUSHITA (1937) reported 2 unnamed species of *Pleuronectites* from the lower Triassic of Kurotaki in Tosa. One of them is easily distinguished from the present species by the outline, convexity and the general appearance of ears. The other is represented by an incomplete fairly convex specimen without the umbonal region.

Occurrence:—Collected by KATAYAMA (1938) at a small valley near Hirabara, Omine-mura, Mine-gun in province Nagato, from the light purplish gray coloured shale in the uppermost part of the lower Carnic Hirabara formation in the Mine series (HASE, 1950).

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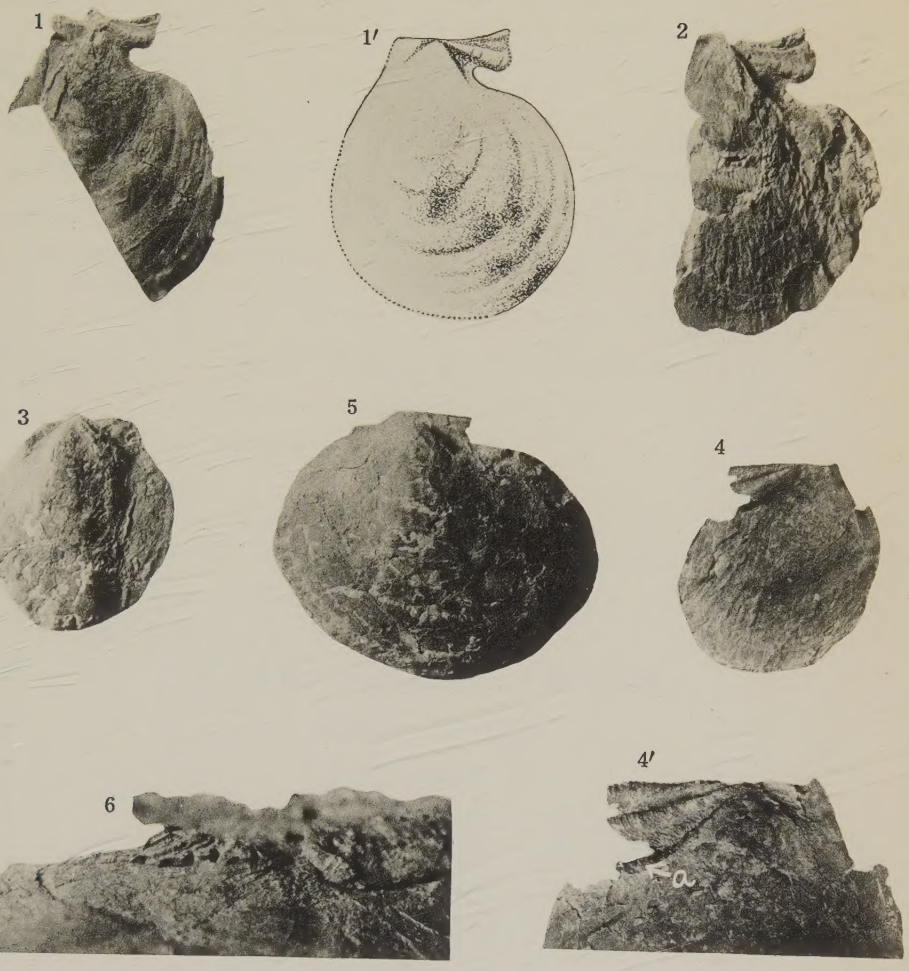

UEKI photo.

Explanation of Plate 5

Pleuronectites hirabarensis AMANO, n. sp.

Fig. 1. Holotype: Exterior of right valve, ×1: Fig. 1′. Restored figure, ×1.
Fig. 2. Paratype: Exterior of right valve, ×1.
Fig. 3. Holotype: Exterior of left valve, ×1.
Fig. 4. Interior of right valve, ×1: Fig. 4′. Showing lanceolate area (a), ×2.
Fig. 5. Depressed right valve: Exterior, ×1.
Fig. 6. A series of holes on right valve, ×6.
Loc. Hirabara, Omine-mura. Mine-gun, Nagato.

日本古生物学会例会通知

	開催地	開催日	講演申込〆切日
第60回例会（済）	福岡	1955年 2月12日	1月15日
第61回例会	京都	6月18日	5月31日
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CONSTITUTION
of the
PALAEONTOLOGICAL SOCIETY OF JAPAN

ARTICLE 1. Name

The Society shall be known as the Palaeontological Society of Japan. The Society is a section of the Geological Society of Japan.

ARTICLE 2. Object

The object of the Society shall be to promote the study of palaeontology and related sciences.

ARTICLE 3. Achievement

The Society in order to execute Article 2 shall (a) issue the Society journal and other publications, (b) hold or sponsor scientific lectures and meetings, and (c) sponsor collecting or field trips, and lectures.

ARTICLE 4. Membership

The Society shall be composed of persons who are active of interested in palaeontology or related sciences, and shall be known as regular members, honorary members, and patrons.

ARTICLE 5. The members of the Society shall be obliged to pay annual dues to the Society, for which they shall enjoy the privilege of receiving the Society's journal and of submitting papers which have been read and discussed at the meetings for publication in the Society's journal.

ARTICLE 6. Administration

The Society shall have the following organizations for its administration.

(a) General meeting. The general meeting shall be composed of the Society members. More than one tenth of regular members shall be present to hold general meetings. Administrative affairs shall be decided during the general meeting.

(b) President. The president shall be elected from among the regular members. The president shall represent the Society and supervise its business matters.

(c) Council. The council shall be composed of councillors who are elected from among the regular members. The council shall discuss administrative affairs.

(d) Business council. The business councillors shall be elected from among the council members, and shall administer business affairs.

(e) Officers shall be elected by vote of returned mail ballots, as a general rule.

ARTICLE 7. Amendments to the constitution shall be by decision of the general meeting.

By-Laws and Administration

ARTICLE 8. The Society's journal shall be issued quarterly.

ARTICLE 9. Regular members shall be persons who have knowledge, experience, or interest in palaeontology or related sciences.

ARTICLE 10. Patrons shall be selected individuals or organizations who give special support to the objectives of the Society.

ARTICLE 11. Honorary members shall be persons of distinguished achievement in palaeontology. The council shall nominate honorary members for decision by the general meeting.

ARTICLE 12. Applicants for membership to the Society shall submit their full name, mailing address, date of birth, occupation, and name of school from which they graduated.

Dues

ARTICLE 13. Rates for annual dues of the Society shall be decided during the general meeting. Annual dues for regular members are Yen 600.00 (domestic members) and U.S. $ 3.00 (foreign members). Patrons are individuals or organizations donating more than Yen 15,000.00 annually. Honorary members are free from obligations.

ARTICLE 14. The Society income shall be from membership dues and bestowals.

ARTICLE 15. The Society shall have one chairman, fifteen councillors, and several business councillors, whose term of office shall be two years. They may be re-elected.

Addendum

ARTICLE 1. There shall be four business councillors for the present.